<u>AMENDMENTS TO THE CLAIMS:</u>

This listing of claims will replace all prior versions and listings of the claims in the application:

1.   (Original) A quantizer estimator, comprising:

a linear regression unit to generate a quantizer estimate from input values of prior quantizer selections and coding rates,

first memory to store predetermined values of quantizer selections and coding rates, the table indexed by a complexity indicator signal,

second memory to store quantizer selections and coding rates of previously coded P pictures, and

a selector selectively coupling an input to the linear regression unit to the first memory when a picture type signal indicates an I picture and to the second memory when the picture type signal indicates a P picture.

2.   (Original) The quantizer estimator of claim 1, further comprising:

a second selector, coupled to the second memory, to select a maximum value of two previous quantizer selections,

wherein the first selector selectively enables the second selector when the picture type signal indicates a B picture.

3.   (Original) The quantizer estimator of claim 2, further comprising a quantizer rounder to round values output by the linear regression unit to a nearest integer.

4.   (Original) The quantizer estimator of claim 1, wherein the second memory has depth for storage of only three sets of quantizer selections and coding rates.

5.   (Original) The quantizer estimator of claim 1, further comprising a quantizer rounder to round values output by the linear regression unit to a nearest integer.

6.   (Original) The quantizer estimator of claim 1, further comprising

a median calculator coupled to the storage unit, to calculate a median of a last three quantizer selections,

a quantizer rounder, coupled to an output of the linear regression unit,

an estimate validity unit to determine, when the picture type signal indicates a P picture, whether the output of the linear regression unit is a valid value, and

a second selector, having inputs coupled to outputs of the median calculator and the quantizer rounder, an output coupled to an output of the quantizer estimator and controlled by the estimate validity unit.

7.   (Original) The quantizer estimator of claim 6, wherein, when the output of the linear regression unit is a valid value, the estimate validity unit causes the second selector to select the output from the quantizer rounder.

8.   (Original) The quantizer estimator of claim 6, wherein, when the output of the linear regression unit is a valid value, the estimate validity unit causes the second selector to select the output from the median calculator.

9.   (Original) The quantizer estimator of claim 6, wherein a quantizer estimate Q from the linear regression unit is valid if $15 < Q \leq 45$.

10.   (Original) The quantizer estimator of claim 6, wherein a quantizer estimate Q from the linear regression unit is valid if $|Q-Q_{prev}| < 10$, where Q_{prev} is a quantizer selection of a most recently coded P picture.

11.   (Original) A method of estimating a quantizer for pictures of a video sequence, comprising:

for an I picture, estimating a quantizer according to a linear regression analysis upon assumed values of quantizers and coding rates, the assumed values derived from a complexity indicator of the I picture,

for a P picture, estimating the quantizer according to the linear regression analysis upon values of quantizers and coding rates of prior P pictures, and

for a B picture, selecting the quantizer estimate from a maximum of quantizer selections of two most-recent P pictures.

12.   (Original) The method of claim 11, further comprising rounding the quantizer estimate to a nearest integer.

13.   (Original) The method of claim 11, further comprising retrieving the assumed quantizer and coding rate values from a table based on the complexity indicator of the I picture.

14.   (Original) The method of claim 13, wherein the complexity indicator represents spatial complexity of the I picture.

15.   (Original) The quantizer estimation method of claim 11, wherein the quantizer estimate Q_I is given by:

$$Q_I = \frac{b}{T_I - a}, \text{ where}$$

a and b are the coefficients.

16.   (Original) The quantizer estimation method of claim 11, wherein the target coding rate T_i is determined by:

$$T_i = \max\left\{ \frac{R}{\left(1 + \frac{N_P X_P}{X_I K_P} + \frac{N_B X_B}{X_I K_B}\right)}, \frac{bitrate}{8 * picturerate} \right\}, \text{ where}$$

R represents a number of bits allocated to code a group of pictures in which the I picture resides,

N_P and N_B respectively represent the number of P and B pictures that appear in a group of pictures,

X_I and X_P respectively represent complexity estimates for the I and P pictures in the group of pictures,

K_P and K_B determine relative bit allocations between P and B pictures in the group of pictures.

bitrate represents the number of bits allocated for coding of the group of pictures, and

picturerate represents the number of pictures in the group of pictures.

17.   (Original) The method of claim 11, wherein for a P picture, the linear regression analysis derives a quantizer estimate from a target bitrate assigned to the P picture.

18.   (Original) The method of claim 17, wherein the quantizer estimate for a P picture is given as:

$$Q_p = \frac{b}{T_p - a}, \text{ where}$$

Q_p is the quantizer estimate of the P picture, T_p is a target bitrate calculated for the P picture and b and a are coefficients derived from a set of previous quantizer selections and previous coding rates (respectively Q and S) according to:

$$a_p + S - bQ^{-1}$$

$$b_P = \frac{\sum (S)(Q^{-1}) - n(\overline{S})(\overline{Q^{-1}})}{\sum (Q^{-1})^2 - n(\overline{Q^{-1}})^2}.$$

19.   (Original) The method of claim 17, wherein the target bitrate T_p is given as:

$$T_P = \max\left\{ \frac{R}{\left(N_P + \frac{N_B K_P X_B}{K_B X_P}\right)}, \frac{bitrate}{8 * picturerate} \right\}$$, where

R represents a number of bits allocated to code a group of pictures in which the P picture resides,

N_P and N_B respectively represent the number of P and B pictures that appear in a group of pictures,

X_P and X_B respectively represent complexity estimates for the P and B pictures in the group of pictures,

K_P and K_B determine relative bit allocations between P and B pictures in the group of pictures.

bitrate represents the number of bits allocated for coding of the group of pictures, and

picturerate represents the number of pictures in the group of pictures.

20.   (Original) The method of claim 11, further comprising:

testing a quantizer estimate for the P picture to determine if it is valid, and

if the P picture's quantizer estimate is not valid, calculating a substitute quantizer estimate as a median of a predetermined number of quantizers used for previous P pictures.

21.   (Original) The method of claim 20, wherein the P picture's quantizer estimate is valid if it falls within a predetermined window of quantizer values and if a difference between the quantizer estimate and a quantizer of a most recently processed P picture is less than a predetermined value.

22.   (Original) A quantizer estimation method, comprising, for a new P picture:

performing a linear regression analysis on quantizer values and coding rates for a predetermined number of previously coded P pictures,

generating a first quantizer estimate for the new P picture based on the linear regression analysis and with reference to a target coding rate assigned to the new P picture,

generating a second quantizer estimate for the new P picture as a median of a second predetermined number of the previously coded P pictures,

based on a difference between the first quantizer estimate and a quantizer of a most recently coded P picture, selecting one of the first or the second quantizer estimates as a final quantizer estimate for the P picture.

23. (Original) The quantizer estimation method of claim 22, wherein the P picture's quantizer estimate is valid if it falls within a predetermined window of quantizer values and if a difference between the quantizer estimate and a quantizer of a most recently processed P picture is less than a predetermined value.

24. (Original) The quantizer estimation method of claim 22, wherein the quantizer estimate is given as:

$$Q_p = \frac{b}{T_p - a}, \text{ where}$$

Q_p is the quantizer estimate of the P picture, T_p is a target bitrate calculated for the P picture and b and a are coefficients derived from a set of previous quantizer selections and previous coding rates (respectively Q and S) according to:

$$a_p + S - bQ^{-1}$$

$$b_P = \frac{\sum(S)(Q^{-1}) - n(\overline{S})(\overline{Q^{-1}})}{\sum(Q^{-1})^2 - n(\overline{Q^{-1}})^2}.$$

25. (Original) The quantizer estimation method of claim 22, wherein the target bitrate T_p is given as:

$$T_P = \max\left\{ \frac{R}{\left(N_P + \frac{N_B K_P X_B}{K_B X_P}\right)}, \frac{bitrate}{8 * picturerate} \right\}, \text{ where}$$

R represents a number of bits allocated to code a group of pictures in which the P picture resides,

N_P and N_B respectively represent the number of P and B pictures that appear in a group of pictures,

X_P and X_B respectively represent complexity estimates for the P and B pictures in the group of pictures,

K_P and K_B determine relative bit allocations between P and B pictures in the group of pictures.

bitrate represents the number of bits allocated for coding of the group of pictures, and

picturerate represents the number of pictures in the group of pictures.

26. (Original) The method of claim 22, further comprising rounding the quantizer estimate to a nearest integer.

27. (Currently Amended) A quantizer estimation method, comprising, for an I picture:

deriving coefficients for linear regression analysis [[based on]] by referring a complexity indicator of the I picture to a lookup table of coefficient values,

performing linear regression analysis based on the coefficients, and

generating a quantizer estimate for the I picture based on the linear regression analysis and with reference to a target coding rate assigned to the I picture.

28. (Cancelled)

29. (Currently Amended) The quantizer estimation method of claim [[28]]27, wherein the lookup table stores values as shown in FIGS. 20A and 20B.

30. (Original) The quantizer estimation method of claim 27, further comprising deriving the complexity indicator from image content of the I picture.

31. (Original) The quantizer estimation method of claim 27, wherein the complexity indicator represents spatial complexity of the I picture.

32. (Original) The quantizer estimation method of claim 27, wherein the quantizer estimate Q_I is given by:

$$Q_I = \frac{b}{T_I - a}, \text{ where}$$

a and b are the coefficients.

33. (Original) The quantizer estimation method of claim 27, wherein the target coding rate T_i is determined by:

$$T_i = \max\left\{\frac{R}{\left(1 + \frac{N_P X_P}{X_I K_P} + \frac{N_B X_B}{X_I K_B}\right)}, \frac{bitrate}{8 * picturerate}\right\}, \text{ where}$$

R represents a number of bits allocated to code a group of pictures in which the I picture resides,

N_P and N_B respectively represent the number of P and B pictures that appear in a group of pictures,

X_I and X_P respectively represent complexity estimates for the I and P pictures in the group of pictures,

K_P and K_B determine relative bit allocations between P and B pictures in the group of pictures.

bitrate represents the number of bits allocated for coding of the group of pictures, and

picturerate represents the number of pictures in the group of pictures.

34.   (Original) The method of claim 27, further comprising rounding the quantizer estimate to a nearest integer.